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Mr. Damon Franz
Regulatory Analyst, Energy Division
California Public Utilities Commission
505 Van Ness Ave
San Francisco, CA 94102
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Dear Mr. Franz:

Chromasun appreciates the California Public Utilities Commission staff's and CSI-Thermal Program Administrators' effort to identify issues and set priorities for considering eligibility of non-water heating and process-heating to the CSI-Thermal Program.

Please find attached comments to your questionnaire. Please do not hesitate to contact me if you feel that I could be of further assistance to the program.

Best Regards,

Andrew Tanner
VP Engineering
andrew@chromasun.com

General Questions:

If applicable, please describe the technology that your company produces and the types of applications it would likely serve.

Chromasun is the manufacturer of a rooftop solar concentrator panel that can consistently supply up to 400^0F. Chromasun is also developing a hybrid PV-Thermal unit that can supply electricity and hot water concurrently. Both of these technologies will be applied to various forms of solar cooling (e.g absorption, adsorption and desiccant).

Are there existing standards developed by an independent agency that provide guidelines for proper system design and installation of the technology you employ?

We work with solar thermal integrators that are most aware of the various building codes applicable to the deployment of our technology. Sufficient standards are in place already, so I do not believe that the CSI program needs to be involved in standards development for system design and installation.

The exception to this belief is metering. Chromasun believes that it is important that the CSI becomes actively involved in the metering standards used by solar thermal technology (see below).

What tools do you use to estimate building loads and predict the energy production/offset of your system?

We use historical gas bills and discussions with plant managers. We are looking at big projects where load prediction is somewhat easier. Building-load prediction still remains the 1,000-pound gorilla.

Do you have recommendations for metering displaced energy that can more cost-effective than the methods currently listed in the Program Handbook?

Metering remains a hot topic, particularly moving forward with this program as energy streams to solar cooling technologies increases. Standardizing the metering requirement will enable the price to come down.

In order for Solar Thermal energy to (eventually) qualify for RECs, a metering standard will need to be implemented. Chromasun would like to see a framework in place for the meters to communicate in a "smart" manner and couple the communication technologies already implemented with smart gas and electricity meters.

Suggested resources that could be of assistance to the program is the OIML (International Organization of Legal Metrology) and the European standard for metering (EN 1434 – Heat Meters).

EN 1434 consists of the following parts, under the general title "Heat meters":
- Part 1: General requirements
- Part 2: Constructional requirements
- Part 4: Pattern approval tests
- Part 5: Initial verification tests
- Part 6: Installation, commissioning, operational monitoring and maintenance

The following person at U.S. EPA is interested in collaborating with the CSI Thermal program staff on developing a metering standard for solar thermal projects for purposes of establishing a framework for generating solar thermal renewable energy credits (RECs):

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U.S. Environmental Protection Agency
Climate Protection Partnerships Division Climate Technologies and Distributed Generation
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Technology-Specific Questions

Space Heating or Combination systems (space heat/Domestic Hot Water):

Residential:

Under the current residential rules, systems are held to an incentive cap of $1,875. Many systems providing water heating plus additional thermal energy would exceed this cap.

Should the incentive cap be increased for combination systems?

NA

If the cap were to be increased for combination systems, how much or by what method should we use to determine the new cap?

NA

If the cap could not be increased, is it worth developing/including a residential combination system incentive?

NA

Under the current residential rules, most combination systems would not be eligible because SRCC does not certify systems that are intended to provide non-water heating thermal energy.

Would it be necessary for the Legislature to change the OG-300 requirement or for SRCC to change its certification practices in order to allow combination systems?

NA

If the OG-300 requirement is not a limiting factor, what sizing rules of thumb should we use for combination systems?

NA

Because the OG-300 rating applies only to domestic hot water production, a new incentive calculation method would be required for the space heating and/or cooling components of a residential combination system.

What should be the method for calculating the incentive for combination systems? Options discussed at the workshop included 1) developing a TRNSYS template to model the energy savings; and 2) developing a standard "kicker" for additional savings based on the methodology described in Attachment A.

Chromasun recommends the use of TRNSYS.

Commercial/Multi-family:

Do you foresee a need to include stand-alone solar space heating?

No. If an application is purely space heating, then Chromasun suggests that you keep it at the same rebate level. Stand-alone solar space heating would be an isolated case that it would not be worth the energy developing a new rebate scheme.

Chromasun does, however, support limiting the rebate to the amount of heating delivered to the building (i.e. summer excess energy ineligible).

Do you foresee applications that produce steam in the collector? If yes, please describe the application.

We do not foresee applications that produce steam in the collector even though concentrating collectors are emerging that will have that capability. Direct steam generation presents numerous hurdles which makes it less desirable than simply heating water. Commercial/Industrial applications that use steam have a significant boiler feed-water preheat load where the returning steam condensate from the process (~180^0F) can be reheated under pressure to ~230^0F (under pressure it stays liquid). The boiler then does the remaining work to produce steam.

Many buildings have a heating loop that has various take-offs for DHW, HHW and steam cooking. A cafeteria is an example of this. These systems are tankless, because of the volume of the loop. The CSI requirement for a tank should, therefore, be relaxed for systems of this type.

Should we develop installation standards and system design requirements? If so, what should those standards be, or by what process should we develop them?

No. the boiler, plumbing and building codes already have this covered.

How should we calculate energy displacement for purposes of paying incentives? Payments can go to any parties involved. Options discussed at the workshop include:

-Up Front: Program Administrators create a simulation tool to predict system performance, and payment is made in one lump sum based on that estimate.
-Performance-Based Incentive: Pay incentive based on actual metered energy displacement over a number of years. The nominal value of the incentive would be increased to compensate the customer for time-value of money. Metering cost would be born by the applicant.
-70/30 true-up: A partial payment is made up front, and the balance paid after 1 year of metering.

Chromasun suggests the 70/30 true-up method for installations where there is solar cooling equipment driven by solar collectors rather than PBI.

Should project size determine the incentive calculation method?

Yes. Chromasun supports the current thresholds of 30kW and 250kW. These thresholds should remain for process and hydronic heating applications, however, systems employing thermally driven chillers should use the 70/30 true-up methodology irrespective of size.

Options for determining load profiles include: 1) Use data from pre-installation metering for a given period and extrapolate to create a load profile for 8760 hours of the year Professional Engineer stamp would likely be required); and 2) Use data from the California Commercial End Use Survey Data (link: http://www.energy.ca.gov/ceus/index.html)

If the incentive payment is based on a modeling simulation, how should we determine building load profiles? If there are options for determining load profiles other than those listed above, please provide them here.

Load profiling will always remain the challenging task. Whilst not fully abreast of the contents of this 339-page document on load profiles, it appears to be a good resource for benchmarking loads.

One approach that Chromasun would like to suggest is for a load profile report submitted with the CSI application that details the assumptions made. Whilst a PE stamp is one way of bringing credibility to the process, the reality is that many of the installers are just as well positioned to report loads without the PE stamp. Like the process for inspections, perhaps a waiver on the requirement for the PE stamp could be provided once a number of reports are submitted by the installers/applicants.

Process Heat:

What types of process heat applications will you consider installing? Please describe the load and the system configuration, including temperature needs, storage needs, etc.

The process heating applications that we are looking at involve millions of therms of gas, such as food processing. For these systems, the easiest integration of the solar thermal system is into the DA (Deaerator) tank or make-up water tank. These tanks are often extremely large and sufficient in volume for a large solar installation.

As the energy required to convert liquid water into steam is equivalent to heating water by 80^0C/144^0F, even small steam systems generally require hundreds of collectors and have existing storage in place. If a solar thermal installation designer wants to consider producing actual steam then this is achieved more easily by running a heat transfer oil through a heat exchanger that transfers the heat to the steam-production process. Alternatively, pressurized water can be flashed to steam in a steam drum. These two methods would be favorable over steam produced in the actual collector.

It should be noted that direct steam generation would not be eligible under the CSI,t because there is no passive freeze protection for the collector. Chromasun suggests that “active” solar concentrators (non-CPC) be eligible to run pressurized water as a heat transfer fluid and use active freeze protection for the system.

For food processing, some of these applications have loads that are very seasonal. An example is tomato processing which peaks for 3 months of the year (late summer). It is important in those instances to size for the baseload heating that it required as they still continue to operate for the remaining 9 months, but at a lower level. Other process heat applications such as the pharmaceutical industry and the manufacturing sector run base-load process heating year round.

Do you foresee applications that produce steam in the collector? If yes, please describe the application.

No. As above. Pressurized water or high temperature oils are significantly more attractive.

Should we develop installation standards and system design requirements? If so, what should those standards be, or by what process should we develop them?

No. Boiler, plumbing and building codes have this covered.

How should we calculate energy displacement for purposes of paying incentives? Payments can go to any parties involved. Options discussed at the workshop include:

-Up Front: Program Administrators create a simulation tool to predict system performance, and payment is made in one lump sum based on that estimate.
-Performance-Based Incentive: Pay incentive based on actual metered energy displacement over a number of years. The nominal value of the incentive would be increased to compensate the customer for time-value of money. Metering cost would be born by the applicant.
-70/30 true-up: A partial payment is made up front, and the balance paid after 1 year of metering.

Chromasun recommends the Up-front method using TRNSYS.

Whilst Chromasun understands that TESS has been developing new collector types for concentrating collectors (based on the SRCC Standard 600 / EN12975-2), we would like to emphasize the importance of integrating these collector types into the online calculator.

Should project size determine the incentive calculation method?

Chromasun supports the current thresholds of 30kW and 250kW

Options for determining load profiles include: 1) Use data from pre-installation metering for a given period and extrapolate to create a load profile for 8760 hours of the year Professional Engineer stamp would likely be required); and 2) Use data from the California Commercial End Use Survey Data (link: http://www.energy.ca.gov/ceus/index.html)

If the incentive payment is based on a modeling simulation, how should we determine building load profiles? If there are options for determining load profiles other than those listed above, please provide them here.

Process heating applications are generally easier to profile as they have well-defined loads that are repeatable. Historical gas data and interviews with the boiler plant operator have yielded sufficient information to characterize loads.

Solar cooling:

Do foresee installing solar assisted absorption chiller with gas back-up to replace part of an existing electric system chiller?

Yes, the dominant installation scenario, however, is supplementation of the chilled water load.

Do you foresee applications that produce steam in the collector? If yes, please describe the application?

No. Pressurized water driven (or oil) are much preferred by the solar industry

Should we develop installation standards and system design requirements? If so, what should those standards be, or by what process should we develop them?

No. TRNSYS and other modeling tools are essential for these system designs and reveal deficiencies in system design. Given that it is proposed that TESS will provide a rebate calculator for these systems.

Chromasun would also recommend observing the practices of the SGIP program for the integration of thermally driven chillers at the end of CHP systems (I.e. CCHP).

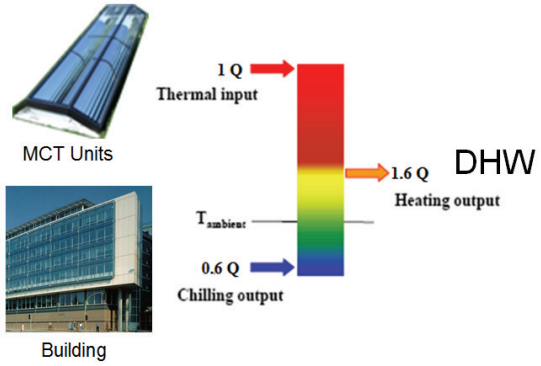
How should we calculate energy displacement for purposes of paying incentives? Payments can go to any parties involved. Options discussed at the workshop include:

-Up Front: Program Administrators create a simulation tool to predict system performance, and payment is made in one lump sum based on that estimate.
-Performance-Based Incentive: Pay incentive based on actual metered energy displacement over a number of years. The nominal value of the incentive would be increased to compensate the customer for time-value of money. Metering cost would be born by the applicant.
-70/30 true-up: A partial payment is made up front, and the balance paid after 1 year of metering.

Should project size determine the incentive calculation method?

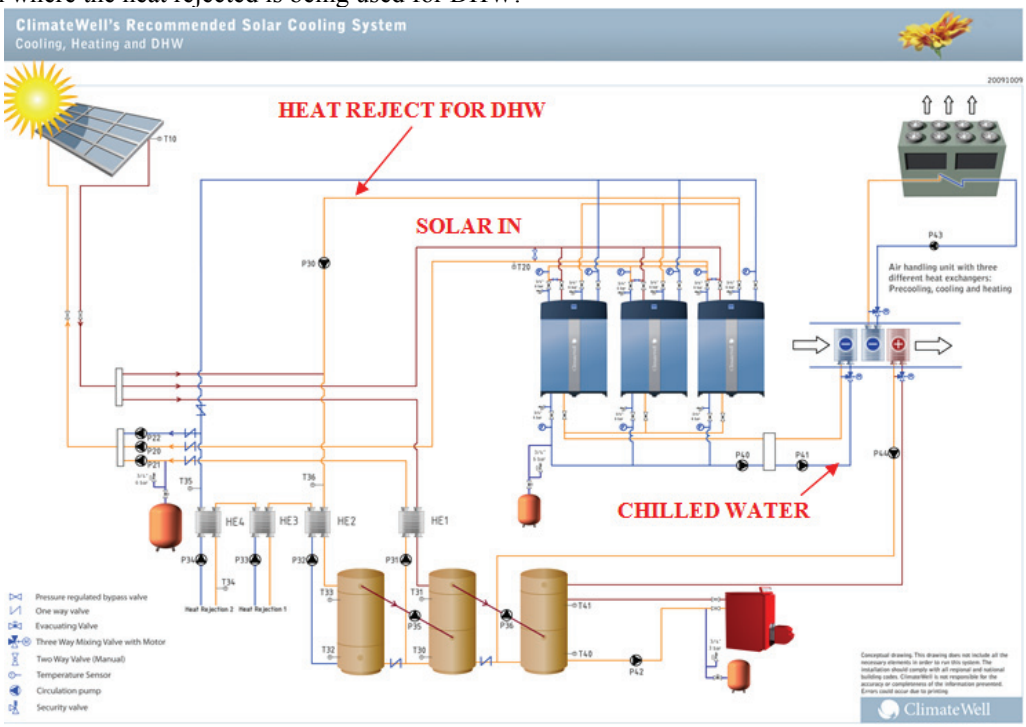
Chromasun believes that TRNSYS should be the incentive calculation method for all systems, however, a 70/30 true up method should be required for a solar cooling system.

Absorption chillers can actually be a method to remove heat from the building and reapply it to DHW. (i.e. more energy is delivered for DHW than was directly generated by the solar collectors.) Below 1.6 times as much DHW is provided at 130^0F by solar collectors running at 250-300^0F. The chiller actually takes heat out of the building despite producing chilled water:



The heat rejected from this equipment (e.g. absorption chiller) should be eligible for the rebate if it is applied for DHW or heating hot water applications. If the CSI Thermal program remains consistent based on the thermal energy that is displaced, then the reject heat from the solar cooling system should be rebated.

An example system where the heat rejected is being used for DHW:



Chromasun also supports the development of a rebate for chilled energy produced through solar cooling.

TRNSYS is a powerful tool that can be used to model almost every possible application of solar thermal collectors. Chromasun would suggest that it continue to be used as the method to calculate the incentive.

Options for determining load profiles include: 1) Use data from pre-installation metering for a given period and extrapolate to create a load profile for 8760 hours of the year Professional Engineer

stamp would likely be required); and 2) Use data from the California Commercial End Use Survey Data (link: http://www.energy.ca.gov/ceus/index.html)

If the incentive payment is based on a modeling simulation, how should we determine building load profiles? If there are options for determining load profiles other than those listed above, please provide them here.

Building simulation software such as EnergyPlus, Energy Pro and Trnsys can be used but they require expertise, time and building analysis. The lowest hanging fruit is applications where there is an insatiable appetite for both heating and cooling (e.g. hospitals).

Good Solar Cooling Resources:

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